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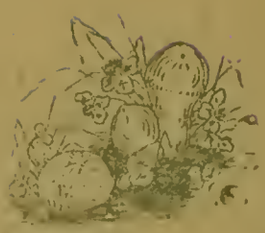

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MAYFLOWERS GONE TO SEED.

PHOTO BY E. J. BURNHAM.

NATURE STUDY.

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Mayflower Seeds.

BY EDWARD J. BURNHAM.

People living elsewhere than along the Atlantic coast, from New England to Pennsylvania, and, rarely, somewhat farther southward, can form only a vague idea of the fascination which the "Mayflower" has for those who associate it with the earliest recollections of childhood.

The Pilgrims found its trailing stem, heart-shaped leaves and fragrant, rose-colored blossoms in the springtime after that first terrible winter at Plymouth. They rejoiced at the discovery, and all who have come after them have taken a peculiar delight in the fragrance and beauty of the modest blossoms hiding beneath the leaves. Linnæus named this trailing plant *Epigæa repens*, but to the New Englander it has always been the Mayflower.

But, well known and eagerly sought for as the Mayflower is, almost to its extinction as population increases, comparatively few people, even where it is most common, have ever seen its fruit, or seed capsules. This was strik-

ingly shown by inquiries made last June of more than fifty persons, members of the Manchester Institute and others who love flowers and know somewhat about them. Of this number, only two had ever seen a Mayflower "gone to seed," and these were keen-eyed gentlemen, fond of trout-fishing, and accustomed to find their way carefully and observantly through all sorts of wild and out-of-the-way places, who had sometimes seen the Mayflower in fruit, and had been reminded of the "cheeses" of the Mallow (*Malva rotundiflora*), another delight of childhood.

The picture, showing the seed capsules slightly larger than natural size, is of a cluster sent by a lady in Andover, N. H., who, having noticed that bees were busy about the blossoms, continued her observations and later found the perfect fruit in considerable quantities. It has been generally assumed that the Mayflower commonly reproduces itself by sending down roots from the joints of the trailing stem, and that seeds have little to do with its increase or persistency in any given locality. It will, therefore, be of interest to make careful observations in future years for the purpose of ascertaining whether the seeds are frequently or but rarely produced.

The capsules, which, as shown by the photograph, suggest the "cheeses" of the Mallow, are divided into five compartments, each of which is closely packed with tiny seeds. The number of seeds varies widely, but even in those capsules which contain the fewest there are so many as to suggest that if seed-bearing were common with the Mayflower, it could no more be exterminated than the field daisy can be.

The seeds, seen beneath a low power of the microscope, or with a good hand lens, are very beautiful. They are regularly elliptical in shape and of a bright gold color, tending to a rich brown as they become fully ripe and dry.

They are apparently covered with a fine netting, which is the reason for the statement, in the few botanies which notice the seeds at all, that they are "reticulated." In reality, the netted appearance is due to innumerable tiny pits, regularly arranged in diagonal rows over the entire surface.

It is to be hoped that the readers of NATURE STUDY throughout New England, the eastern portion of New York and Pennsylvania, possibly, too, even as far south as Kentucky and the mountain region of North Carolina—wherever, in fact, the trailing Epigæa may be found—will make careful observations next year as to the seeding of the Mayflower, and report the results, that they may be published in our magazine and also in the Proceedings of the Manchester Institute.

Birds and Animals.

You will recall James Russell Lowell's tribute to June, which begins with those familiar lines:

> "And what is so rare as a day in June?
> Then, if ever, come perfect days."

These expressions also linger in our memories: "The little bird sits at his door." "The high tide of the year," and "Everything is happy now." We all agree with Lowell that everywhere in June there is home-life and happiness. And what a host and variety of homes there are! We find them of many forms and down in queer places.

Perhaps one of the queerest is the home of the swifts inside a chimney at the farmhouse. All day these soot-colored little birds have been racing through the air, twittering socially and gathering insects for the little ones in the many homes down in that big chimney. Perhaps there may be as many as a thousand birds living in one of these large, old-fashioned chimneys—a bird village in soot and smoke. Did you ever see a chimney swift alight on a tree? Did you ever see him alight anywhere? What persistent workers they are!

Another family gathering that interests us is that of the porcu-

pines feeding on water plants at the pondside by moonlight. Altogether a family of dull wits we might call them, for it would be difficult to find animals more intensely stupid. But they prize their pondside home, and wander around among the shrubbery and climb trees in perfect confidence that no animal can easily drive them away from their home. The mother porcupine made her nest in some nearby hollow log. The little ones, to the number of two or three in each home, were born early last month, and by this time are able to go out with their mother and seek food as she does.

Then there is that home in mid-air, the nest of the Baltimore oriole. The home surely looks enough like a hornet's nest to deceive a bird of prey. Some naturalists regard it as an example of real "protective mimicry."

In marked contrast to this bird home swaying in even the slightest breeze is that of the kingfisher, in a hole in the solid bank of earth by the pondside. Not far away from this bank, down in the deepest water, is the family of the bullheads—in some localities called catfish or horned pouts. How fierce and persistent is the mother in protecting her little ones! In spite of this a little bullhead does now and then disappear, and some perch swims off less hungry than before.—*St. Nicholas.*

Nature.

BY CHARLES H. OAKES.

Man hath the making of his own life's joy:
I thought it lay with Fate, and let the stream
Of years flow on, unmindful, like the boy,
Flecking my life by living in a dream.
So Nature spied me in my tinseled den,
And took my hand and led me forth, wide-eyed
And mouth agape, far from the herds of men,
Into the realm where she alone doth bide.
And there—O Muse!—the velvet summer skies—
Soft-wafted scents and winnowed sounds—the fair
Earth's front of glories crowding to mine eyes—
My soul burst, bud-like, from its world of care,
And bloomed henceforth for her who charmed it free—
A bloom poised smiling o'er the wild brook's glee.

The Crafty Ostrich.

A well known hunter and taxidermist tells this story of personal experience in South Africa. It goes far toward dispelling a slander that has long clouded the fair name of the ostrich:

"Arriving at one of the monster hills of the white ant, I climbed upon it and raised my observation glasses to my eyes for a careful survey of the region. My first glance showed me, arising from the dead level of the plain beyond, two objects, each having the form of a capital S. These I knew were the heads and necks of two ostriches. Though I believed they had sighted me, I remained immovable until their necks were suddenly drawn down to the level of the tops of the bushes which screened their bodies. Then I knew for a certainty that they were aware of my presence and would make a quick retreat.

"Without losing an instant's time I ran to the spot where the birds had been standing and found their tracks. These I followed as far as they were distinguishable and then took a course which I believed the birds would naturally follow. No sooner had I reached the top of the ravine than I saw one of the ostriches climbing the side hill. Estimating the distance I took sight and fired. The ball passed immediately between his legs and struck in the sand of the side hill behind him.

"In an instant the bird darted away like an arrow in the direction of a small clump of bushes in the center of an open space.

"That he would pass behind this bush and then finally emerge on the other side seemed certain, and I aimed to catch him as he made a fresh start from behind the thorn. He flew over the sand at a terrific rate and reached the bushes. Then I waited fully five minutes for him to emerge from his hiding, with my rifle ready sighted so that I could pull the trigger the second he reappeared, but finally went forward to rout him out. When I reached the clump of bushes an examination of the sand showed that the crafty old bird had shifted his course at right angle, making the turn so suddenly that his feet had plowed up the sand for a distance of several inches. This wary tack had placed the bushes between the bird and myself, and he made his way to new cover while I was innocently waiting for him on the other side of the ambush. An Apache Indian could not have executed this maneuver more cleverly and I smiled at myself for having been foolish enough to believe the traditional story of how the silly ostrich buries his head in the sand and believes that he is thereby concealed.—*Philadelphia Post.*

The Story of Pike.

BY UNCLE NED.

CHAPTER V.

As the fall changed to winter and the water of the lake became colder, Pike was less active than he had been throughout the summer. He was not so hungry and rarely took the trouble to catch anything to eat. In fact, all the creatures that lived in the water became sluggish and some grew to be actually torpid, burrowing into the mud and sleeping there until spring should come again.

As the cold increased, ice formed over all the surface, thin at first, but growing thicker and heavier until it seemed as if the lake groaned beneath its weight. There were weird sounds on still, cold nights, as the water beneath struggled with the vast burden that lay upon it, lifting it and rending it asunder. With loud reports, like the discharge of cannon, great cracks opened from the center to the shore. Later the snow fell, covering everything. The ice and the water ceased struggling together, and all the lake was still.

Then, on winter days, Pike often heard above him the creaking of ox-sleds and the heavy tread of the oxen. Sometimes, too, he heard the merry sounds of coasting; swift sleds plunging down the bank, and the laughter of children.

One day, as he lay half asleep in the dim light that came down through the snow and ice above him, Pike heard the scraping of a shovel and the sound of axe-blows. Soon a hole was cut through the ice and the water rushed upward to fill it. Some insects—water bugs and beetles—hurried toward the light and rose with the water, as almost always happens when a hole is cut through ice in winter. Pike,

too, turned that way, for the light was pleasant after so much darkness.

He heard voices that he had heard before, and that might perhaps have made him think of summer, if he had not been a pickerel. The boy and girl lived in houses not far apart, and their fathers had come to the lake to fish and had brought the children with them. Pike knew nothing about fishing, as yet, except his own way of catching minnows, and all that happened that day was new and strange to him.

From the ice above came the sounds of footsteps, of the low, slow speech of men and the eager questions of children. Then a shiner was lowered into the water with a hook through its body and a long line attached. The shiner swam round and round, sometimes tugging at the line and sometimes leaving it slack above him.

Pike had not been hungry for a long time, but the sight of the shiner swimming about gave him thoughts of eating. The shiner was larger than the minnows, but it looked good and Pike eyed it wistfully. Presently he came nearer, and made up his mind. The shiner was too big to be taken at a mouthful, so Pike seized it by the tail and tried to swallow it gradually.

He had got nearly as far as the point of the hook, when there was the sound of running on the ice, the line tightened, and Pike found himself drawn rapidly upward. He swam rapidly round and round, tugging at the line and trying to let go of the fish that seemed so much too big for him. As he came to the top of the water, with the ice walls all around him, he made a last desperate jerk and the shiner was pulled away from him. As he hurried back under the ice, the boy said excitedly:

"Oh, what a big fellow! It was almost as long as my arm!"

The girl laughed merrily. It was not the first time she

had heard him tell of the fish that got away; moreover, she had caught a glimpse of Pike as he came to the top of the water.

Soon there was the heavy step of a man, and a little later another shiner came down through the hole. But Pike had learned a great lesson, and for long after was careful about shiners with hooks in their bodies and lines that came from above downwards. He moved away a little and watched the shiner swimming about in the light that came down through the hole above it, but he did not feel hungry.

By and by, Pike saw something coming out from the shadows back in the darker water. It came swiftly and straight for the shiner. It was a big pickerel, that did not know as much as Pike about this kind of shiner, for it had never learned Pike's lesson. It took the shiner in its mouth and swam as far as the line would let it. Then there was more hurrying on the ice, and the sound of children's voices, and any one might easily guess that the boy was pulling hard at the line and the girl was looking at him.

Sometimes the big pickerel would be dragged upward through the water; sometimes he would have his way again and pull the line down after him. The boy tugged with all his might, and the girl had no thought of laughing; for the fish this time was really big, and both were much in earnest.

"Oh, don't wind the line around your hand! Father said it would cut if it should slip, and then you will be hurt dreadfully."

The boy was having a hard time of it, and the little girl was thoughtful. Then came a heavy step on the ice, and the line was drawn in steadily. The pickerel struggled with might and main, but it could not keep from following. It was dragged along quite helplessly; sometimes on its side, sometimes on its back, and sometimes

with its head turned downwards. But it made no difference in the end, for the fish went up through the hole in the ice and Pike could hear it flopping about above him.

There were other holes made in the ice that day, and many shiners swam about with hooks and lines attached to them. Many more pickerel were caught, but none nearly so large as the first one. The boy had never seen one half so large, and had tried very hard to land it. That had been more than he could do, and his hands had blisters on them; but the little girl praised him for his strength and spirit, and did not laugh at him again that day.

Pike had seen enough of fishing; so he went away to another part of the lake and passed the winter quietly.

Facts about Precious Stones.

The diamond, queen of precious stones, keeps herself in unsullied purity from all combinations, and at the same time holds the secret of her birth and education locked securely within her own breast, so that the cleverest of our scientists cannot tell how or when she was formed; neither can they explain why pure carbon in one part of the world should appear as a sparkling gem, and in another should present itself as the very useful but hardly ornamental plumbago or black lead.

Ranking next the diamond in value comes corundum, which seems able to assume any color. It may be quite clear and resemble the diamond except in a lesser degree of hardness; or yellow, when it is known as topaz. Originally "topaz" meant a yellow stone, but as yellow stones are numerous the word "oriental" is prefixed to show its superiority to every other kind of yellow stone. Again, corundum may take a blue tint and produce a sapphire; or red and become a ruby; green and rank as an emerald; or purple and be known as an amethyst; but to distinguish

the corundum gems from all other precious stones of similar colors the word "oriental" is again used—oriental emerald, oriental sapphire, etc. Corundum with the tint of "pigeon's blood" is the rarest and most treasured. Crystallization in these stones brings out the structure, and in a strong light a silvery six-rayed star may be seen, which gives the name "star stones" to these gems.

All precious stones, except the diamond, are formed of compounds of different elements, and yet one stone may be identical with another in composition, but entirely different in appearance and structure. The alexandrite and oriental chrysolite, for example, have the same chemical composition and yet they are totally unlike each other to look at, for the former is very dark-green by daylight and red by artificial light, while the latter is simply a greenish-yellow by both lights. Spinel is softer than corundum, but it ranges through an iris of coloring. Its red and rose-tinted varieties are the spinel and balas rubies, used as pivots for the wheels of watches.

Quartz, when clear, is the Brazilian pebble of the spectacle-maker. Some quartz crystals seem of a very friendly disposition, and take into their hearts fine needles of other minerals. One quartz crystal exhibited has its "ghost" always on view. After the crystal was formed another started to grow in its interior and the result is truly ghostly. Other quartz crystals hold in their stony thraldom water and bubbles of air, and this, together with the fact that casts of shells are found consisting of pure quartz and chalcedony, tells that the mineral matter must have been deposited first in liquid form. From the smoky varieties of quartz we get the cairngorm and occidental topaz, whilst the violet amethyst is distinguished from all other varieties of quartz by its rippled fracture. Opal is formed from a combination of silica and water. Sometimes, however, these two substances refuse to crystalize, and it

would seem that in the struggle to depart from the ordinary routine, fractures occur, which in the end give that delightful play of color for which opals are so famous, for opals are merely an amorphous form of silica combined with water. The fire opal from Mexico is especially beautiful in its caprice of colors, which range from honey-yellow to flaming hyacinth-red.

One of the most valued of precious stones is the emerald, a bright-green variety of beryl. Emeralds are full of flaws and cracks, so that a large and perfect specimen is very rare. When the stone is colorless it retains the name of beryl, when bluish-green it is known as aquamarine.

A variety of precious stone, emerald-green in color, to which the name "hiddenite" has been given, was discovered in rather a strange way. An emerald mine in North Carolina yielded but *one* emerald. However, during the working another kind of stone was found, almost identical in color, but entirely different in composition, which has never before or since been found anywhere else. Specimens of artificially colored agate exhibited are very interesting. For many years the agate industry was carried on at Oberstein, on the banks of the Rhine. In time all the available material became exhausted, and to fill its place agate was brought from America as ballast. Some layers of agate, it appears, are porous and some are not. The stones are boiled in colors, and the porous bands take in the stain while the denser ones refuse it. The result shows tinted bands alternating with white, as in the natural specimens.

Tourmalines are of almost every conceivable color, and among them is found the interesting occurrence of a green outer crystal enclosing a red one. Tourmaline reminds one of some of Culpepper's herbal prescriptions, where a little of everything comes in. Indeed, it seems almost

easier to say what elements tourmaline does not consist of than what it does. Black tourmaline is in great request for mourning jewelry.—*Nature Notes.*

Nature Study Lessons. XXVI.

BY EDWARD J. BURNHAM.

Plants are found almost everywhere. They cover nearly all the land surface of the globe, and not a few are found in the sea. Perhaps it is because they are so common that comparatively few people take the trouble to know much about them. Perhaps, too, botany, as it was taught in many schools until recently, was not made as interesting as it might have been.

But it is a great pity that any child should grow up and go through life without being able to recognize the common wild flowers and call them by their names. There is real pleasure in greeting them as old friends year after year, returning in a regular procession that advances steadily from the hobblebush and the violets of springtime to the goldenrod and the asters of the fall. Nor is one restricted to the blossoms in their brief seasons; for the trees, the shrubs, the vines, and parts of many other plants remain with us throughout the year, and may be observed under many widely differing aspects. So there is always something in the plant world, at any time of the year, well worth seeing, if we have only learned what to look for.

There is much to be said about the great advantage of cultivating the faculty of seeing, and the ease with which it may be developed and expanded, at least by the young. But instead of talking about it, the very best way is to begin; and one need not go far, unless he lives in the heart of some great city. The first bit of wild roadside one comes to will furnish the chance for a great deal of seeing, with plenty to think about afterwards.

The first thing to see—and a wonderful thing it is, too—is the great profusion, the susprising number of individuals and of different kinds that are crowded together. There have been ever so many more seeds than could possibly find a place to sprout in, and ever so many more sprouts started than could possibly find room in which to grow. So the plants have been compelled to fight among themselves to the death for air and light and standing room.

It is worth while to mark off a small piece of ground, say three feet square, in any tangle of wild plants, as by the roadside or in a neglected fence corner, and count the plants growing there, at the same time taking notice of the different kinds. The total number will be a surprise, and so, too, in most cases, will be the wide variety.

As a rule, in the wild state, not many plants of the same kind are found growing closely together. Two plants of the same kind require the same conditions in order to live and grow. They must have the same kind of food; their roots are alike and certain to get in each other's way; they have the same arrangement of branches and leaves, by which they endeavor to secure the needful amount of sunlight and air. Under such similarity of conditions, the stronger will almost surely overpower the weaker; while two plants that are unlike, having different arrangements of roots and leaves, may grow near together without seriously interfering with each other.

While counting the kinds of plants growing together on a small area, it will be observed that they are naturally distinguished by their differences. While all are plants, and as such have some general characteristics in common, as roots, stems, leaves, blossoms and fruits, there is a great diversity in the quality, form and arrangement of these parts. Some plants have one kind of root system and some another; some have hard stems and others soft ones; in some the leaves are large and round, in others small

and heart-shaped or long and narrow; while the blossoms and seeds present an almost infinite variety.

We thus begin by learning to know plants, as we do insects, birds and all objects in nature, by their differences. But we soon observe that two plants which are unlike may have one or more things in common. They may have the same kind of roots, their stems may be of a similar character, their leaves may have the same arrangement, or their blossoms may be alike in some essential feature.

Those plants which possess some feature that is common to themselves but which is not found in other plants, are said to belong to the same group or family, and they are given a family name by which all the different kinds of plants that have this common feature are known. Thus we learn to know plants first by their differences and then the groups of plants by their resemblances.

All plants have roots, and nearly all have stems, leaves, blossoms and fruit, or something that takes the place of them. In the next Nature Study Lesson we will see what we can find out about the roots of such plants as we can come by easily. We will find out how many kinds there are by studying their differences; and then we will try to find out what plants may be placed in groups whose members have the same root resemblances.

Humming in the Air.

Gilbert White, known the world over as "The Naturalist of Selborne," frequently heard a humming in the air which, close observer as he was, he could never satisfactorily explain. Since his time other English naturalists have made note of a similar phenomenon, and several theories have been advanced in explanation.

A few months ago, a writer in *Nature Notes*, the organ of the Selborne Society, reported observations which led

him to attribute the mysterious sound to bumble-bees. In reply to this, Mr. F. Gibbons wrote to the same publication that in the case of his own observations he saw no bumble-bees or other insects to cause the sound, and he goes on to ask whether it can be possible that they were very high up in the air, out of sight.

"On dry summer evenings," writes Mr. Gibbons, "most flying insects rise very high, but it seems scarcely feasible that such insects as bees should rise so high as to be out of sight, seeing that they would have no apparent inducement, their food being entirely on the ground. Were there only a few bumble-bees about one would naturally expect the humming sound to be more or less intermittent as the individual came near to hand; but such was not the case when I heard it. The sound was regular, much like that proceeding from a grove of lime trees in blossom, when surrounded with thousands of bees. I cannot help thinking that the origin of the sound must be much more obscure than the insect theory, or Gilbert White, who frequently heard this humming, would have determined its origin, for he was an extremely shrewd and quick observer."

On the other hand, another observer, Mr. F. J. Partridge, furnishes *Nature Notes* an account of an observation which suggests the insect theory in a different form. He writes:

"I see there has been another letter on this subject, but I believe the right explanation will be found in this. Let me give my description of the case. I was staying at Minehead, Somerset, in summer, and going for a walk one day up one of the grassy slopes near the sea, I experienced a peculiar sensation of sound. I had walked, as it were, into the midst of a humming noise, the origin of which was invisible, and which surrounded me on every side. I looked up, then down, to the right, then to the left, behind; the humming kept on never altering or wavering, a high pitched indescribable note far beyond the top C of the piano, and nearing those harmonics which the ear is unfitted to transmit prop-

erly, and which bring into use a mid-sense—a sense between hearing and feeling.

"I continued my walk. Bees were busy on the thistle flowers, hover flies and others were flashing here and there, large bumbles would swing into sight and sway off again in long, heavy curves, but the mysterious humming continued through all. Now it seemed to come from the ground! At the top I lay down to enjoy the view and get a rest, as the sun was beating down fiercely and it was very close. I laid my ear against the earth out of curiosity. It certainly was not coming from there. I felt disgusted, and lying back gazed vacantly into the blue. At once I saw the cause of it all. Right above me about three or four feet from the ground a line of tiny black gnats were playing in a long vertical line. As I rose up they rose also and followed me wherever I went, keeping the same vertical line and the same distance, viz., a little behind the back of the head and about a foot or more above it, a most difficult position for discovering them, and also a position where their sound would not be well located by the ear. I sprang into the air trying to upset their line and disperse them, but they perseveringly reformed and continued playing. At the bottom of the fields I had to pass through a wood, here they vanished, the sound gradually dying away. It was quite a relief. I believe I am right in saying gnats and their allies play in short, vertical lines, while alder-flies, etc., play in long, horizontal lines. The former play by dropping straight and returning to the same point again in zigzags to dodge those on their way down. The latter, generally playing over pools, do the same, only horizontally. I believe this will explain Mr. Gibbons' note."

Sounds in Nature.

The atmosphere is the grand medium by which sound is conveyed, though recent discoveries prove that other bodies conduct it with greater expedition, as in the instance of vibrating a tuning-fork, to the stem of which is attached a packthread string; on the other end being wrapt round the little finger, and placed in the chamber of the ear, the sound will be audibly conveyed to the distance of two hundred yards, though not perceptible to any

bystander. Miners, in boring for coal, can tell by the sound what substance they are penetrating; and a recent discovery is that of applying a listening-tube to the breast to detect the motions of the heart. The quickness which some persons possess in distinguishing the smaller sounds, is very remarkable. A friend of the writer has declared he could readily perceive the motion of a flea, when on his nightcap, by the sound emitted by the machinery of his leaping powers. However extraordinary this may appear, we find a similar statement is given in the ingenious work upon insects, by Kirby and Spence, who say, 'I *know* of no other insect, the tread of which is accompanied by sound, except indeed the flea, whose steps a lady assured me she always hears when it passes over her nightcap, and that it clacks as if it was walking in pattens!' If we can suppose the ear to be alive to such delicate vibrations, certainly there is nothing in the way of sound too difficult for it to achieve.

Cats and dogs can hear the movements of their prey at incredible distances, and that even in the midst of noise, which we would have thought would have overpowered such effects. Rabbits, when alarmed, forcibly strike the earth with their feet, by the vibration of which they communicate their apprehensions to burrows very remote. As an instance of the discriminating power of the ear of the elephant, we may mention a circumstance that occurred in the memorable conflict of shooting the maddened elephant at Exeter 'Change. After the soldiers had discharged thirty balls, he stooped, and deliberately sunk on his haunches. Mr. Herring, conceiving that a shot had struck him in a vital part, cried out—"He's down, boys! he's down!" and so he was only for a moment: he leapt up with renewed vigor, and at least eighty balls were successively discharged at him from different positions before he fell a second time. Previous to this, he had nearly brought

down the building of Exeter 'Change by his furious lunges, flying round his den with the speed of a race-horse. In the midst of the crash of timber, and the hallooing of the assailants, he recognized the voice of his keeper in his usual cry, "Chunee, bite--Chunee, bite," which was his command to kneel; and the noble beast actually knelt, and received a volley of balls that terminated his suffering.—*William Gardiner, in The Music of Nature.*

A Trapdoor Spider.

In many parts of California may be found in great numbers nests of the large trapdoor spider, *Bothriocyrtum californicum.* The plow has been very destructive of these, but the writer once estimated that, in a certain locality long untilled, there were in a single acre as many nests of large size as there were square yards, while the very small ones, detected with difficulty, were far more numerous. Any but a close observer might walk over fields where these are common without observing a single abode, so perfectly does the door simulate the ground surface, especially when rains are frequent, as the door then becomes completely covered with growing vegetation like that about it.

Specimens of the nests—the upper part, including the door—are familiar objects in the shops of curio dealers, where they are offered for sale along with their stuffed and distorted builders.

Not of less interest than the nest is the life history of its maker. It lives much longer than spiders belonging to most other genera. One year after hatching it measures scarcely three-sixteenths of an inch in length, exclusive of limbs, while an adult measures one and one fourth inches.

By measuring the yearly growth of immature spiders, of various sizes, that were kept under surveillance for that purpose for three years, it was found that ten or fifteen years are required for them to reach maturity. After that the spider's life is problematic; but several spiders known to have been adults three years ago are still relatively active. Bearing in mind its very peculiar life, which is one of little action, it is not unreasonable to believe that it may live more than twenty years, all told.

More wonderful than its longevity is the fact that during its entire life, exclusive of the few months passed within the nest of the

mother spider, it maintains but a single home, a tunnel in the ground, of its own digging, widening and deepening it as its own growth requres. It will suffer from flood, famine and devastation rather than abandon the home of its first choice. Without a knowledge of its habits, the significance of various layers of silk upon the underside of the door of its home is not apparent. The layers, which resemble thin, white paper, are closely united, but may be separated with care. They are made one at a time, a single layer covering the entire underside of the door at the time the layer is fabricated. Once each year during the growth of the spider, the door, composed of earth and silk, is enlarged by adding wet earth to its free edge, after which a new layer of silk is applied, extending over the new as well as over the old part. As many as six or eight layers may be removed from an old door, but seldom more than that number, as the older ones disappear by process of decay.

When the door is removed, the spider makes a new one having a single covering. Other layers are subsequently added, even in the case of an adult, but in the latter instance the successive coverings lie wholly one upon another, not being separated at their edges by earth, as the full-grown spider has no occasion to re-enlarge its door.

The operation of making the door is an interesting one, and the entire process may be observed without inconvenience by placing a spider in a box of wet earth. The hinge-bearing edge of the door is perfectly straight upon the upper side, as is also that part of the tunnel's edge to which it is joined. Against a central point on the straight edge of the tunnel's rim, the spider first presses a small particle of mud. Being wet it adheres readily, which allows the artisan to turn about and spread over it a quantity of silk, which makes it more secure. On top of this, and at either end of it, other particles are carefully adjusted in like manner to the rim or to those in place, the operation being repeated until the structure is a third or a quarter of its destined width, when it is pulled over to a horizontal position, the spider presumably sensing an added security. Further additions to its edge are made by raising the door each time to a vertical position. The growing edge is circular in outline from the start, and is moulded to the proper thickness between the fangs and mandibles of the builder.

No silk is purposely applied to the upper side, but the under surface is well smeared with it, the greater part being added a little at a time as each particle of earth is put in place. The word

smeared is used because the silk of this spider and others of its class issues from long rows of pores in the underside of finger-shaped organs, which are drawn over a surface from side to side, and more often while in contact.

The employment of plastic earth in making the door makes the fitting of that object perfect; for while it is yet wet it is drawn down into the flaring opening of the tunnel, the soft edges yielding where pressure is greatest. When a door is well pulled down, water may stand over it for several hours without entering the tunnel further than to moisten the wall and its lining.

The heavy earthen door, usually of adobe, with its stout coating of silk, is well suited to protect the designer from insect foes, but in June or July the spider enters upon a period of inactivity which, in the case of those half grown or younger, extends through the summer and autumn or until the so-called rainy season appears; and these young spiders, as an additional safeguard, barricade the door by packing wet earth against it from within, completely filling the upper part of the tunnel. The lower end of the plug is made dome-like, smooth, and is coated with silk like that covering the rest of the wall.

The adults do not employ a like means, but the immature spiders that are over half grown, and some adults, fasten the door with a quantity of silk applied to the wall of the tunnel and to the door at their line of contact, by which the door is well fastened down.

The protection afforded by these means enables the immature spider to pass through its helpless molting stage unmolested, and the adult female to fabricate her one egg cocoon of the year, and attend it, undisturbed.

The tunnel in which it passes this peculiar existence is, for the time, practically air-tight, being made usually in heavy clay, or adobe, very hard in summer, and having its smooth wall covered completely with a closely woven and firmly adhering coat of fine silk. Though much of the soil in which these spiders live cracks freely during the rainless summer, the cracks do not rupture the wall of the tunnel, which often appears harder than the surrounding soil, and may receive some special treatment in addition to the troweling, or smoothing, which the spider gives it.

The spider's condition during this time of complete seclusion should not be described as lethargic, since it becomes active when disturbed, but it consumes no food whatever for five or six months, nor does it partake of water, unless such is gathered in some unexplained manner from the humid air of the closed cell.

Remarkable as are the natural conditions under which the spider exists throughout the dry season, it is capable of enduring like conditions for a much longer time, as shown by actual test in the case of three adults selected for the purpose. These were kept for sixteen months unquestionably without food, showing no ill effects of treatment. In this instance proper food was offered at the end of twelve months—the writer not having the heart to continue the experiment longer—but the offering was declined, as the spiders were then enduring the semi-lethargic condition, out of which they emerged in due time, to take food naturally.—*C. E. Hutchinson, in Scientific American.*

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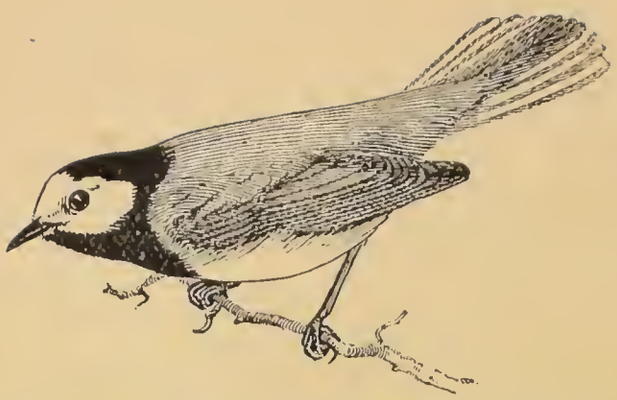

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